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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,315	02/17/2004	Shingo Hashimoto	NECW 19.698A	9726
26304	7590	06/10/2004	EXAMINER	
KATTEN MUCHIN ZAVIS ROSENMAN 575 MADISON AVENUE NEW YORK, NY 10022-2585			TRAN, LONG K	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/780,315	Applicant(s) HASHIMOTO, SHINGO	
	Examiner Long K. Tran	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 17-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-10 and 13-16 is/are rejected.
- 7) ☒ Claim(s) 3,11 and 12 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/136,980.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 02/17/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Claims **1 – 19** are pending in this application.
2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

Group I. Claims **1 – 16**, drawn to a semiconductor device, classified in class **257**, subclass **758**.

Group II. Claims **17 – 19**, drawn to process of making a semiconductor device, classified in class **438**, subclass **662**.
3. The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of following can be shown: (1) that the process as claimed can be use to make other and materially different product or by hand, or (2) that process as claimed can be made by another and materially different process. (MPEP § 806.05(f)). In the instance case unpatentabilities of the group I invention would not necessarily imply unpatentability of the group II invention, since the device of the group I invention could be made by the processes materially different from those of the group II invention, for example, in claim 19, first interconnection is formed in a lower layer of the insulating film instead of upper layer.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, the fields of search are not co-extensive. Therefore, separate examination would be required and restriction for examination purposes as indicated is proper.
4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventor-ship must be amended in compliance with 37 CFR 1.48(b) if one

or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventor-ship must be accompanied by a diligently filed petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(h).

EXAMINER'S AMENDMENT

5. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Michael I. Markowitz on June 07, 2004.

The application has been amended as follows:

Applicant's election without traverse of Group I, claims **1 – 16**, in Paper No. **7** is acknowledged.

Claims **17 – 19** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II, there being no allowable generic or linking claim. Election was made **without** traverse.

Priority

6. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 10/136980, filed on May 01, 2002. *It is notice that the Applicant's Petition for Extension Of Time, filed on February, 17, 2004, for application No. 10/780315 has been transferred to cover application No. 10/136980. The transfer makes the application*

*being abandoned on Sunday, February 15, 2004. Monday, February 16, is a holiday.
Therefore, application No. 10/780315 is eligible of having a priority date of parent
application 10/136980.*

Information Disclosure Statement

7. This office acknowledges of the following items from the Applicant:

Information Disclosure Statement (IDS) filed on February 17, 2004. The references cited on the PTO -1449 form have been considered.

Specification

8. The abstract, line 3: Change "comprising" to -- having --

9. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: -- A semiconductor device having a fuse which makes connection between two interconnection and a low heat-conductive section having a heat conductivity lower than that of the interconnection --.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims **1, 2, 4, 5, 7, 9, 10, 13** and **14** are rejected under 35 U.S.C. 102(e) as being anticipated by Tottori (US Patent Application Publication No. 2002/0014680).

Regarding claims **1, 4, 5** and **7**, figures 1 and 2 illustrate a semiconductor device comprising a tungsten fuse 13 which makes connection between a first aluminum interconnection 14 (at left side of the fuse 13) and a second interconnection (at the right side of the fuse 13), and a low heat-conductive tungsten plug 12 (same side with the first interconnection) which makes connection between said first interconnection and a third interconnection 10 (same side with the first interconnection and plug 12) at a site of said first interconnection where said fuse is not connected (paragraph 0058 and 0060).

Regarding claim **2**, figures 1 illustrates a semiconductor device comprising a second low heat-conductive section (same side with the second interconnection) which makes connection between said second interconnection and a fourth interconnection 10 (same side with the second interconnection) at a site of said second interconnection where said fuse is not connected; wherein said second low heat-conductive section comprises tungsten having a heat conductivity lower than a heat conductivity of a material to form said second interconnection made of aluminum (paragraph 0058).

Regarding claim **9**, figures 1-10 illustrate a semiconductor device comprising a fuse 13 which is formed by filling up, with a buried material, a through hole formed to run through an interlayer insulating film 23; a first low heat-conductive section 12 which is formed by filling up, with the buried material, another through hole formed to run through said interlayer insulating film 23; a first interconnection which is connected to said fuse and said first low heat-conductive section and formed in either an upper layer

or a lower layer of said interlayer insulating film; a second interconnection which is connected to said fuse and formed in a layer other than the layer for said first interconnection; and a third interconnection which is connected to said first low heat-conductive section and formed in a layer other than the layer for said first interconnection; wherein a buried material for said first low heat-conductive section has a heat conductivity lower than a heat conductivity of a material to form said first interconnect (paragraphs 0070 – 0108).

Regarding claim 10, fig. 1 illustrates the interconnection 14 is formed in an upper layer of said interlayer insulating film 23. Tottori does not explicitly teach a blowout of the fuse is made by applying a laser beam from an upper layer side onto a contact site of the first interconnection for the fuse. However this limitation is taken to be a product by process limitation, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324,326(CCPA 1974); *In re Marosi et al.*, 218 USPQ 289,292 (Fed. Cir. 1983); and particularly *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process ” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old or obvious product

produced by a new method is not a patentable product, whether claim in “product by process” claim or not.

Regarding claim **13**, figures 1-10 illustrate a semiconductor device comprising a fuse 13 which is formed by filling up, with a buried material, either a recess section formed in an interlayer insulating film or a trench formed to run through the interlayer insulating film; a first low heat-conductive section 12 which is formed by filling up, with the buried material, either another recess section formed in said interlayer insulating film or another trench formed to run through said interlayer insulating film; and a first interconnection, a second interconnection and a third interconnection which are formed in either an upper layer or a lower layer of the interlayer insulating film; wherein: one end and the other end of said fuse are connected to said first interconnection and said second interconnection, respectively; and one end of said first low heat-conductive section is connected to the other end of said first interconnection, while the other end of said first low heat-conductive section is connected to said third interconnection; and a buried material for said first low heat-conductive section has a heat conductivity lower than a heat conductivity of a material to form said first interconnection (paragraphs 0070 – 0108).

Regarding claim **14**, Tottori discloses the claimed invention of claim 13 except for a blowout of the fuse is made by applying a laser beam from an upper layer side onto the fuse. However this limitation is taken to be a product by process limitation, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be

identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324,326(CCPA 1974); *In re Marosi et al.*, 218 USPQ 289,292 (Fed. Cir. 1983); and particularly *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process ” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claim in “product by process” claim or not.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims **6**, **15** and **16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tottori (US Patent Application Publication No. 2002/0014680) in view of Kawakita et al. (US Patent No. 6,372,554).

Regarding claim **6**, Tottori discloses the claimed invention of claim 1 except for the fuse and the low heat-conductive section comprise polycrystalline silicon. It is

conventional and also taught by Kawakita et al. (US Patent No. 6,372,554; col. 1, lines 45-50; col. 6, lines 46-53; and col. 8, lines 1-7) fuse and plugs are typically comprised of a polycrystalline silicon film. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the fuse and the low heat-conductive section made of tungsten of Tottori with the polycrystalline silicon fuse and low heat-conductive of Kawakita et al., in order to be able to blow out the fuse for allowing an address inherently corresponding to the defective cell to be allocated to a redundant cell.

Regarding claim **15**, figures 1 – 10 illustrate a semiconductor device comprising: a fuse, a first low heat-conductive section and a second low heat-conductive section, all of which are formed on an element isolation oxide film 2; and a first interconnection and a second interconnection, both of which are formed in a first interconnection layer; wherein: said fuse is connected to said first interconnection by a first contact plug, while said fuse is connected to said second interconnection by a second contact plug; and said first interconnection is connected to said first low heat-conductive section by a third contact plug, while said second interconnection is connected to said second low heat-conductive section by a fourth contact plug; and a heat conductivity for said first low heat-conductive section is lower than a heat conductivity for said first interconnection, and a heat conductivity for said second low heat-conductive section is lower than a heat conductivity for said second interconnection (paragraph 0058 and 0060). However Tottori does not explicitly teach the low heat-conductive comprising polycrystalline silicon. It is conventional and also taught by Kawakita et al. (US Patent

No. 6,372,554; col. 1, lines 45-50; col. 6, lines 46-53; and col. 8, lines 1-7) fuse and plugs are typically comprised of a polycrystalline silicon film. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the fuse and the low heat-conductive section made of tungsten of Tottori with the polycrystalline silicon fuse and low heat-conductive of Kawakita et al., in order to be able to blow out the fuse for allowing an address inherently corresponding to the defective cell to be allocated to a redundant cell.

Regarding claim **16**, Tottori discloses the claimed invention of claim 15 except for a blowout of the fuse is made by applying a laser beam from an upper layer side onto the fuse. However this limitation is taken to be a product by process limitation, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324,326(CCPA 1974); *In re Marosi et al.*, 218 USPQ 289,292 (Fed. Cir. 1983); and particularly *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claim in “product by process” claim or not.

14. Claim **8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tottori (US Patent Application Publication No. 2002/0014680)

Regarding claim **8**, Tottori discloses the low heat-conductive section 12 made of tungsten and connected with the tungsten fuse 13. However, Tottori does not explicitly teach the low heat-conductive section serves as a fuse. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the low heat-conductive section serves as a fuse since both fuse and low heat-conductive section are made of tungsten and being connected together at the same location, therefore, the low heat-conductive also serves as a fuse.

Allowable Subject Matter

15. Claims **3**, **11** and **12** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. The following is an examiner's statement of reasons for the indication of allowable subject matter: Claims **3**, **11** and **12** are allowable over the prior art of record because none of the prior art (Tottori (US Patent Application Publication No. 2002/0014680), Kawakita et al. (US Patent No. 6,372,554), Srikrishnan et al. (US Patent No. 5,469,981) and Bierig (US Patent No. 4,032,949)) whether taken singularly or in combination, especially when these limitations are considered within the specific combination claimed, to teach:

A semiconductor device comprising a third low heat-conductive section which makes connection between a first interconnection 31 (figs. 6(a) and 6(b)) and a fifth interconnection 34 (figs. 6(a) and 6(b)) at a site of the first interconnection where neither the fuse nor the first low heat-conductive section is connected (as cited in claim 3); the fuse comprising a plurality of first plugs 51 (figs. 5(a) and 5(b)) connected in parallel between said first interconnection and said second interconnection, a plurality of first plugs 51 (figs. 5(a) and 5(b)) being buried in a plurality of through holes which are formed to run through said interlayer insulating film; and said first low heat-conductive section comprises a plurality of second plugs 53 (figs. 5(a) and 5(b)) connected in parallel between said first interconnection and said third interconnection, a plurality of second plugs 53 (figs. 5(a) and 5(b)) being buried in a plurality of other through holes which are formed to run through said interlayer insulating film (as cited in claim 11)

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Srikrishnan et al. (US Patent No. 5,469,981), Bierig (US Patent No. 4,032,949) and Koike (US Patent Application Publication No. 2002/0063305) disclose a

semiconductor device similar to that of (Tottori (US Patent Application Publication No. 2002/0014680) and Kawakita et al. (US Patent No. 6,372,554).

18. A shortened statutory period for response to this action is set to expire e (three) months and 0 (zero) day from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned (see MPEP 710.02 (b)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 571-272-1797. The examiner can normally be reached on Mon-Thu.

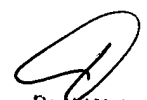
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Long Tran



June 08, 2004



David Nelms
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